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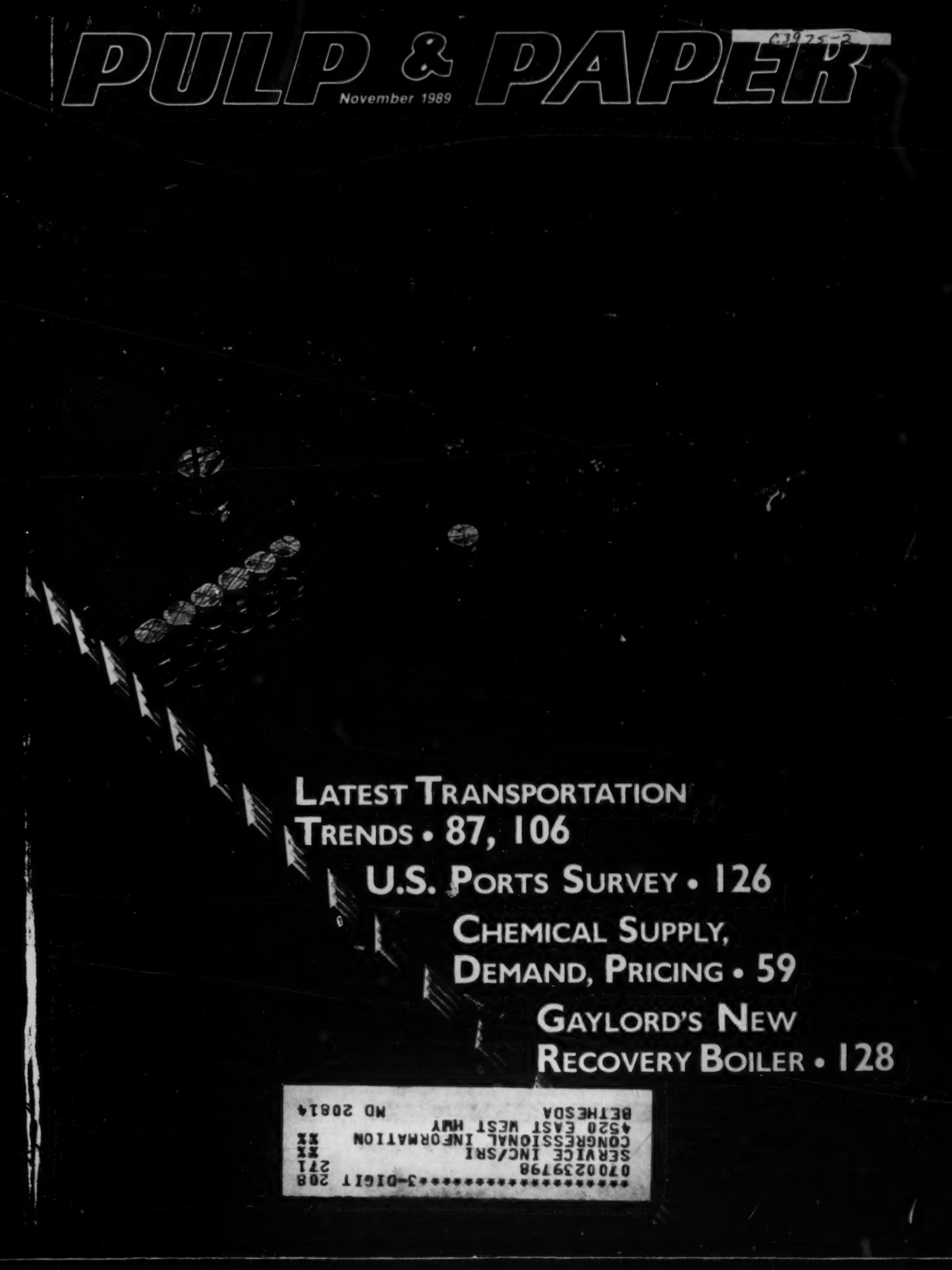
PULP & PAPER

November 1989



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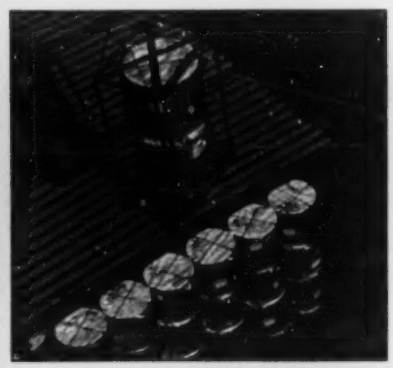

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THE COVER

Transportation of pulp, paper, and woodchips is becoming a more important operation as companies streamline operations and take advantage of a favorable transportation market. This issue focuses on current transportation trends in the paper industry. **(Photo of barge loading at Potlatch's Lewiston Idaho, mill by Tom Tracy courtesy of Potlatch Corp.)**

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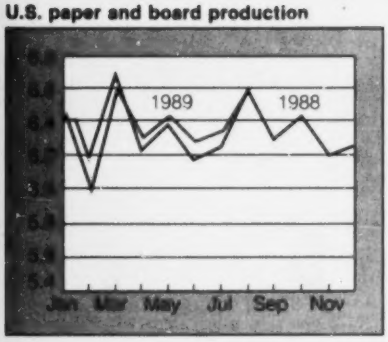
ABP

BPA

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.6 million tons in August, down 0.2% from the same month last year, according to the American Paper Institute. On a seasonally adjusted basis, the annual production rate through August was 37.94 million tpy for paper, down 1.0% from 1988, and 38.59 million tpy for paperboard, up 0.9%. Inventory drawdowns and sluggish advertising markets have cut into demand for paper this year, according to API, while paperboard has benefited from higher industrial production and more balanced consumer inventories.

Among major grades, printing and writing paper shipments through August were down 1.9% from 1988, thanks to declining shipments of coated paper and uncoated free-sheet. Uncoated groundwood was the one bright spot, rising 8.7% through August. Containerboard production for domestic use was up 1.3%, fueled by a 1.8% rise in fiber box shipments.

Canadian newsprint shipments remained in the doldrums, falling 4.3% to 811,000 metric tons in August. Woodpulp shipments rose 5.8% in August to 693,000 tons but still lagged 3.2% behind for the year to date. Operating rates dipped to 95% at newsprint mills and 96% at pulp mills for the month. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Aug.	510	0.2	5,996	0.5
Uncoated groundwood (s)	Aug.	151	2.7	1,752	8.7
Coated paper (s)	Aug.	652	0.6	7,081	-4.7
Uncoated free-sheet (s)	Aug.	950	-3.3	11,096	-1.8
Other printing/writing	Aug.	134	-0.7	1,537	2.2
Total packaging and other paper (s)	Aug.	426	-1.4	4,881	-3.1
Tissue	Aug.	473	0.4	5,590	2.2
Total paper	**Aug.**	**3,296**	**-0.8**	**37,935**	**-1.1**
Unbleached kraft paperboard	Aug.	1,700	2.0	19,696	1.3
Semichemical medium	Aug.	488	-1.2	5,719	1.4
Bleached paperboard	Aug.	389	-1.5	4,576	0.8
Recycled paperboard	Aug.	724	-0.8	8,673	-2.2
Total paperboard	**Aug.**	**3,300**	**0.5**	**38,666**	**0.8**
Total U.S. paper and paperboard output	**Aug.**	**6,596**	**-0.2**	**76,600**	**-0.1**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	July	5,395	3.4	62,350	2.3
Market pulp production	July	764	4.9	8,875	4.7
Wastepaper consumption at paper/board mills	July	1,578	3.5	18,930	0.7
Pulpwood consumption (cords)	July	8,548	8.2	98,421	3.3
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Aug.	27.709	2.3	209.533[6]	1.8
Containerboard inventories at U.S. box plants and mills	Aug. 1	2,689	-1.3		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	July	916	-12.6	12,626	-1.5
Imports of Canadian newsprint	July	586	-17.2	7,850[6]	-8.3
U.S. paper exports (including products)	July	486	12.8	6,237	12.6
Exports of unbleached kraft linerboard	July	164	-2.4	2,222	3.7
Exports of woodpulp	July	540	37.8	6,372	19.9
Norscan pulp inventories[4]	Aug. 31	1,028	21.7		
Norscan pulp operating rates[4]	Aug.	101%	96%	97%	98%
CANADIAN STATISTICS[5] (reported in metric tons)					
Total newsprint shipments	Aug.	811	-4.3	6,350[6]	-2.5
Operating rates	Aug.	95%	100%	96%	99%
Inventories held by U.S. consumers	Aug. 31	1,344	-16.8		
Other paper/board shipments	Aug.	605	5.8	4,462	-0.2
Woodpulp shipments (export only)	Aug.	693	1.8	5,228	-3.2
Operating rates	Aug.	96%	98%	94%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft paper: Weakness in multiwall grades, but grocery sack downturn bottoms out

Grade Structure: Bag and sack paper is the largest category of kraft packaging papers, accounting for about 60% of total shipments in 1988, followed by multiwall, 29%; converting, 8%; and wrapping, 3%. Basis weights for bag and sack paper range from 30 lb to 80 lb/3,000 ft². Multiwall shipping sack paper is 50 lb or 60 lb. Kraft paper's natural color is brown, but a semi- or fully bleached sulfate process will produce kraft paper in lighter shades of brown, cream, or white.

Production/capacity: Unbleached kraft paper (UKP) shipments declined only 1.4% to 2.8 million tons in 1988 after dropping an average 6.5% each year since 1984. Grocery bag and sack shipments dropped 4.8%, but multiwall paper shipments jumped 7.1%. Although total shipments of kraft paper declined, operating rates remained high because most of the swing machines in the industry produced a substantial amount of linerboard, thus eliminating any excess capacity. Total bleached kraft paper (BKP) shipments increased 14% last year to 465,000 tons.

The shipment figures for 1988 have been revised from previously published figures as a result of an industry survey of market distribution of these papers. This year, the American Paper Institute reclassified 237,000 tons of UKP shipments and 67,000 tons of BKP shipments to the specialty packaging and industrial grades. Additionally, 275,000 tons of UKP capacity and 75,000 tons of BKP capacity were reclassified to the 1989 specialty grades.

For the first seven months of 1989, UKP shipments were down 5.1% from the year before. Grocery bag and sack shipments were off only 1.8%, but multiwall paper was down 9.8% due to slowed demand for shipping sacks this year. Despite this slump, mill operating rates have been close to 97% most of the year because a large amount of swing capacity continues to be dedicated to linerboard production. The industry's actual 1989 UKP capacity is estimated at about 2.7 million tons.

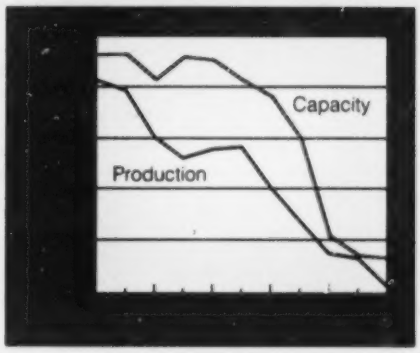
Shipments of bleached kraft paper grades increased only 1.5% in the first seven months of 1989. This modest growth rate reflects a shortage of capacity to produce these grades and not a drop in demand. Every producer of BKP grades is sold out. The capacity shortage was further increased in August when Champion International shut down a machine producing 110,000 tons of lightweight bleached cup stock for conversion to uncoated free-sheet production.

No new kraft paper capacity will be added until Longview Fibre Co. completes construction of a new 300-tpd paper machine at its Longview, Wash., mill. The new machine will produce both bleached and unbleached lightweight packaging grades when completed in mid-1990. Last year, Gaylord Container Corp. increased kraft paper capacity from 300 tpd to 450 tpd at its Pine Bluff, Ark., mill, and this year, it acquired two grocery bag and sack plants. Gilman Paper Co. also increased kraft paper capacity last year at its St. Marys, Ga., mill, but the company has converted most of its production from commodity kraft grades to bleached and semibleached converting grades.

Market segments: After a decade-long decline, grocery bag and sack paper shipments may have finally bottomed out. Grocery and retail bag shipments are down slightly in 1989 due mainly to slower consumer spending; inroads by plastic sacks have abated. Multiwall paper shipments in 1989 and 1990 will continue trailing the 1988 level.

Pricing: Producers increased BK and UBK prices approximately $40/ton in first-quarter 1989. Prices are not expected to rise again until early 1990. Heavyweight (70-lb) grocery sack paper prices are currently between $495 and $505/ton; multiwall (50-lb) grades are between $550 and $560/ton; lightweight (30-lb) unbleached grades are $640 to $665/ton; and lightweight bleached grades are $800 to $810/ton.

Year-end price history for 70-lb grocery sack paper: 1980, $280; 1981, $300; 1982, $240; 1983, $280; 1984, $330; 1985, $300; 1986, $365; 1987, $400; 1988, $455/$465. Multiwall sack paper (50 lb): 1980, $375; 1981, $405; 1982, $360; 1983, $390; 1984, $410; 1985, $360; 1986, $400; 1987, $460; 1988, $510/$520. ■



	1987	1988	1989e
Shipments[1]	2,839	2,800	2,651
Capacity[1]	3,032	2,872	2,869
Utilization rate	93.6	97.5	92.4
Imports	168	162	232
Exports	89	110	117
Apparent U.S. consumption	2,918	2,852	2,766
lb/capita	24.0	23.3	22.3
GNP ratio[2]	0.76	0.73	0.69

e = Estimate.
1. API revised data series.
2. 1,000 tons/billion $ real GNP.

	Annual capacity[1]	Market share (%)
1. Stone Container	773	26.9
2. Georgia-Pacific	355	12.4
3. Union Camp	350	12.2
4. Longview Fibre	285	9.9
5. Gaylord Container	270	9.4
6. International Paper	260	9.1
7. Champion	195	6.8
8. Chesapeake	115	4.0
9. Port Townsend	100	3.5
10. Willamette	70	2.5

Market share of top five companies: **70.8%**

Market share of top ten companies: **96.7%**

Total U.S. capacity (1989): **2.869 million short tons**

1. Unbleached kraft paper capacity only. Some revisions of company capacity figures based on API revised data series.

New Technology, Economic Benefits Give Boost to Secondary Fiber Use

While the U.S. lags behind other countries, environmental concerns and legislation are helping increase both wastepaper recovery and use

By LAWRENCE A. BROEREN

The use of secondary fiber for pulp and paper products can lower costs significantly, preserve forest reserves, and assist in reducing the mounting solid waste problem. With an increasing emphasis on recovering wastepaper, secondary fiber use is growing rapidly, and both fiber recovery and use are expected to continue increasing.

Recovery rate is the amount of wastepaper recovered for reuse compared with paper consumed. Utilization rate is the amount of secondary fiber (recovered fiber) used compared with total fiber used. The two rates will differ depending on the amount of imports and exports of paper and wastepaper and inventory changes.

WASTEPAPER RECOVERY. In the U.S., the recovery rate of wastepaper for recycling is about 27%. Japan and Taiwan have recovery rates approaching 50%, and Europe currently has a recovery rate of about 30%, with Germany at about 35% and Holland between 45% and 50%. The practical recovery rate limit may be about 50%. In terms of imports and exports, the U.S. imports a very small amount of wastepaper, while more than 20% of the wastepaper collected is exported. Several major factors affect the recovery of wastepaper:

Standard of living. Higher standards of living are correlated with increased use of cultural paper, such as newspapers, magazines, and books, and with commercial-industrial activities generating office paper, reports, and computer printouts.

Population concentration. The collection of wastepaper from both commercial-industrial generators and households is easier and more economical with a high population concentration.

Alternate fiber uses. The major alternate fiber use is fuel. Using fiber as fuel can be discretionary or legislated. Fiber used as fuel, however, obviously is not available for papermaking.

Mr. Broeren is corporate consultant, Simons-Eastern Consultants Inc., Decatur, Ga.

Social conscience. Some wastepaper is recovered as a matter of social conscience. Recycling wastepaper reduces the number of trees harvested and helps preserve forest reserves.

Price of wastepaper. Larger volumes of wastepaper are recovered from commercial-industrial operations and households when wastepaper prices are high. There is also a minimum price below which the recovery of wastepaper falls drastically.

Price of competitive fiber. Wastepaper prices are influenced by the price of market pulp. One wastepaper classification—pulp substitutes—tracks market pulp prices.

Legislation. Some communities have laws requiring households to separate recyclable waste products (paper, glass, metal) from other refuse for separate collection and recycling.

The sum total of all the factors affecting the recovery of wastepaper indicates that total recovery and the recovery rate will both continue to increase.

SECONDARY FIBER UTILIZATION. Secondary fiber utilization in the U.S. is about 25%. In Japan, it is about 50%. Europe has a rate of about 48%, with Germany at about 45% and Holland at almost 70%. Five major factors affect secondary fiber utilization:

Quality. Historically, low-quality products were made from secondary fiber. Currently, high- and low-quality products are, or can be, made from secondary fiber.

Technology. Contaminant removal technology, including equipment, chemicals, and process control, has been improving rapidly. The technology must link the wastepaper to the finished product.

Contaminants. New contaminants are continuously developing. New contaminants not only increase the concentration of contaminants and change the combination of contaminants but also require improved contaminant removal technology.

Economics. The primary business reason for using secondary fiber is reduced costs. Reduction can be in both operating and capital costs.

Legislation. Legislation requires the use of secondary fiber in some products. The use of postconsumer waste secondary fiber also has been legislated.

WASTEPAPER GRADES, CATEGORIES. Wastepaper is graded according to Circular PS-83, "Paper Stock Standards and Practices," published by the Paper Stock Institute of America, a division of the National Assn. of Recycling Industries Inc. PS-83 also defines conditions of sale. There are 49 standard wastepaper grades, with nine grade numbers not currently in use and 32 specialty grade numbers.

Wastepaper is commonly grouped into five categories:

- Deinking
- Mixed paper
- Pulp substitutes
- Newspaper
- Corrugated.

The 1988 use for each category is shown in Table 1.

TABLE 1: **Of the five major categories, wastepaper use in 1988 was highest for corrugated, with 49% usage.**

Category	Usage (X 1,000 tons)	%
Deinking	1,710	9
Mixed paper	2,189	11
Pulp substitutes	3,001	15
Newspaper	3,227	16
Corrugated	9,747	49
Total	19,875	100

Source: API

Figure 1 shows the growth in use for each category from 1986 and projected to 1991. Secondary fiber use as a percent of total fiber is shown in Table 2. The use of secondary fiber in each of the eight U.S. regions is shown in Figure 2, along with the percent of total fiber. Wastepaper categories have been associated with specific processes and finished products (Table 3).

CONTAMINANTS. Contaminants include everything that must be removed from wastepaper to make the fibers usable. Common contaminants include ink, staples, paper clips, rocks, sand, chemicals, and stickies. Stickies include all rubber-like substances that retain their tackiness.

The amount of some contaminants, such as ink, determine the wastepaper grade. For example, hard, white shavings (Grade 30) must be free of printing, and sorted white ledger (Grade 40) must be free of heavily printed stock.

TABLE 2: **As a percentage of total fiber, secondary fiber is expected to increase slowly and possibly even dip slightly in 1991.**

	1986	1987	1988	1989	1990	1991
Secondary fiber (%)	24.5	24.4	24.7	25.2	25.0	24.8

Source: API

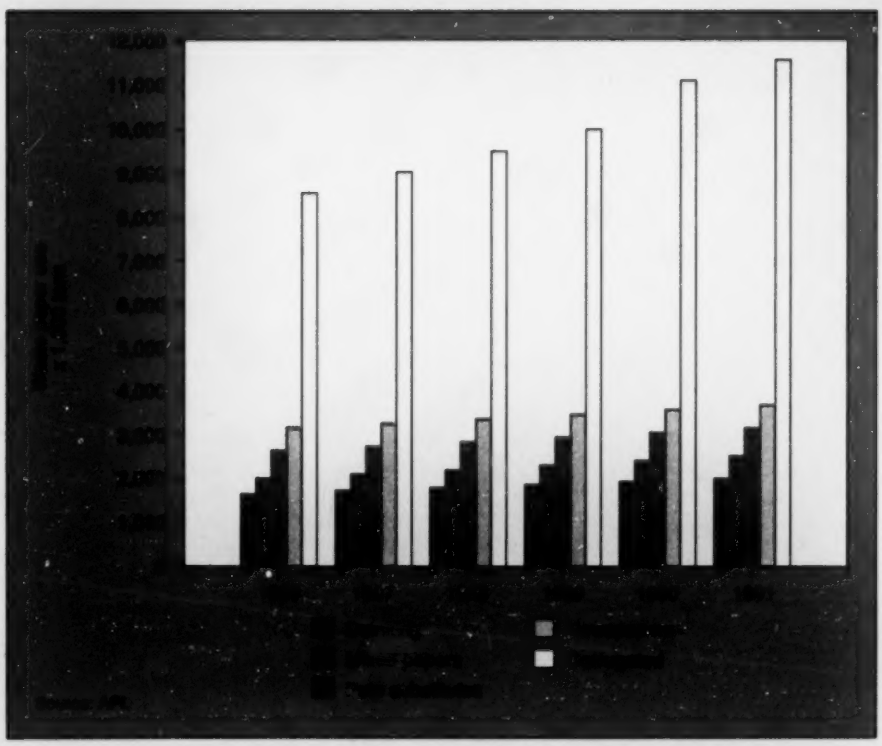


FIGURE 1: **Wastepaper use is expected to continue increasing, with the most use remaining in the corrugated grade.**

Any material that renders wastepaper unusable as the grade specified is classified as a prohibited material and is not permitted in most grades. A small amount (less than 2%) of prohibited material is permitted in a few "low" grades of wastepaper.

Out-throws are materials unsuitable for the wastepaper grade. Out-throws include permitted prohibited materials. Allowable out-throws range from 0% to 10%, with most grades limiting out-throws to 1% or 2%.

A specific material may be classified as an outthrow in one wastepaper grade and a prohibited material in another. Carbon paper is a prohibited material in sorted white ledger (Grade 40), which does not permit prohibited materials. The same carbon paper is an out-throw in mixed paper (Grade 1), which allows up to 10% outthrows.

Within the limits of the grading system, the type and amount of contaminants can vary significantly. During wastepaper and fiber shortages, the tendency is to reduce wastepaper quality in a grade and to increase the wastepaper grade.

New contaminants are constantly being developed. For example, *National Geographic* recently had a holographic cover and insert. Those holographs will be included in some wastepaper for recycling.

Some contaminants, such as nonimpact inks, are significantly increasing in volume. Nonimpact inks are difficult to remove, especially with a washing deinking system. When the volume of nonimpact inks was small, the nonimpact ink dirt count was also small. Now that the volume of nonimpact inks is increasing, the dirt count is also increasing. Steps are being taken to deal

TABLE 3: **Wastepaper categories are associated with specific processes and finished products.**

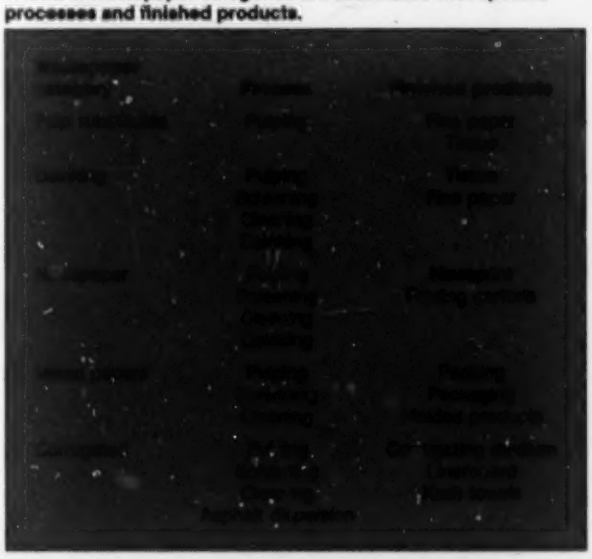
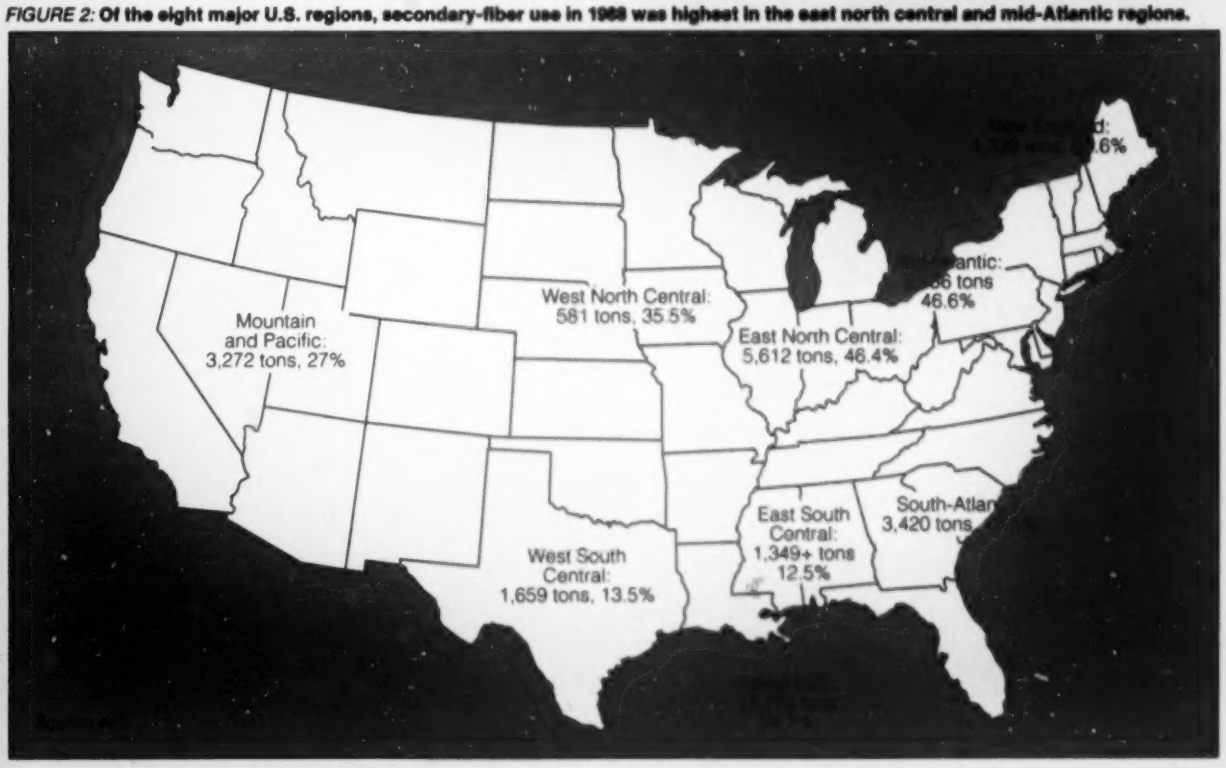


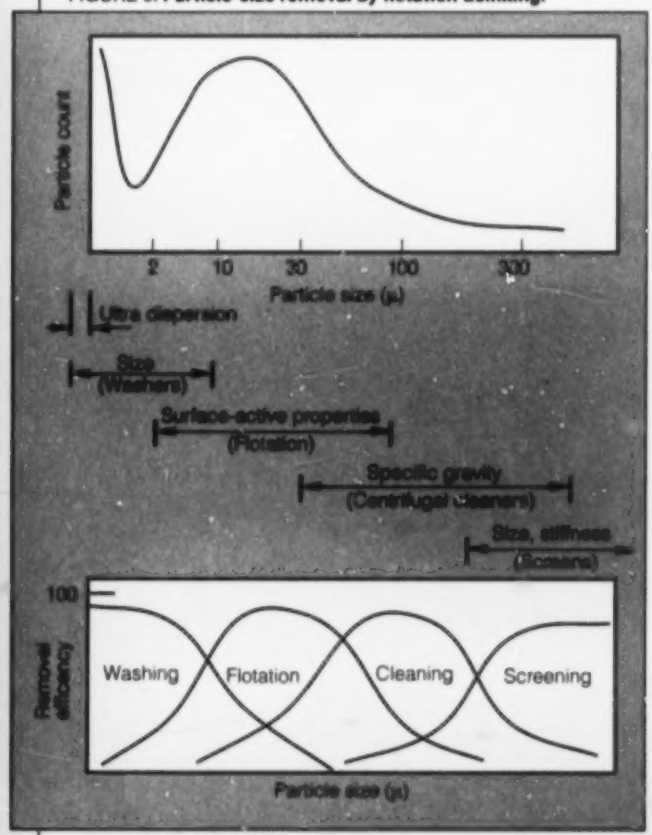
FIGURE 2: **Of the eight major U.S. regions, secondary-fiber use in 1988 was highest in the east north central and mid-Atlantic regions.**



with the increasing amounts of nonimpact inks. The white ledger grade now has a higher-priced subgrade with minimum nonimpact inks. New processing techniques are being developed and used to remove non-impact inks.

Coordination and cooperation between all wastepaper participants—buyer, user, broker, packer, sorter, and seller—are essential. With significant differences in finished product specifications, wastepaper grades and contaminants, process, and the variability in wastepaper grades and contaminants, matching wastepaper to an existing process and finished process specifications is an ongoing, time-consuming task.

FIGURE 3: **Particle-size removal by flotation deinking.**



PROCESSING. As mentioned, the process must link the wastepaper to the finished product. The process must be able to remove enough contaminants so that the secondary fiber can be used to make the finished product within specifications. The major process steps for each of the five secondary fiber categories are shown in Table 4.

Pulp substitutes should require only pulping. To provide paper machine protection, the slushed fiber is usually screened and cleaned, often with the paper machine screens and cleaners. Pulp substitute systems often are stretched by adding small amounts of lightly contaminated wastepaper. Removing these small amounts of contaminants may require using screens, cleaners, and washers.

Corrugated systems require pulping, screening, and cleaning, often in multiple stages. Traditionally, asphalt dispersion systems have been used to disperse contaminants, resulting in a "clean" finished product. New corrugated systems do not include asphalt dispersion.

In the past, processing newspaper for newsprint has been done with a multistage washing deinking process. Current newspaper processing technology uses flotation as the primary ink removal technique. Washing is also used, and dispersion after processing is being evaluated. Dispersion breaks up most of the particles remaining after processing. The dispersed particles are below visual size and, thus, are not visual dirt. These finely dispersed particles can be left in, washed out, or agglomerated and floated out.

Although the major process steps are similar, newsprint deinking is usually considered unique and separate from deinking other wastepaper. This is due to the specific processing requirements for removing oily newsprint ink. In addition, the high percentage of mechanical pulp and the low brightness make this deinked fiber uniquely suited for newsprint and little else.

TABLE 4: **Major process steps for each of the five secondary fiber categories.**

Process	Pulping	Screening	Cleaning	Asphalt dispersion	Washing	Deinking flotation	Dispersion
Wastepaper category							
Pulp substitutes	1						
Mixed paper	1	1	1				
Corrugated	1	1	1	2			
Newspaper	1	1	1		1	3	4
Deinking	1	1	1		1	3	4

1 = Always.
2 = Many in use.
3 = Most new facilities.
4 = Future.

In the past, the U.S. has used the washing process for removing ink, while Europe has used the flotation process. New deinking facilities usually use flotation with washing. Many washing systems are being retrofitted for flotation, and dispersion is also being considered and tried. Flotation deinking particle-size removal is shown in Figure 3.

In washing deinking systems, wastepaper is pulped longer and at a higher pH to end up with more small particles (less than ten microns) and fewer medium-size particles (ten to 25 microns). Washing will remove a high percentage of small particles but only a low percentage of medium-size particles.

Water reuse and clarification is an integral part of deinking. It is especially important in washing deinking systems where there is a return loop from the pulper to the washer to the clarifier and back to the pulper. This loop saves heat, chemicals, and water. The clarifier removes contaminants, specifically ink and clay, so that they are not recycled back into the pulper. Some amount of wastewater must be discharged from the system. This wastewater can be treated by conventional wastewater treatment methods.

The deinking fiber yield ranges from 65% to 85%. The shrinkage, or loss, is from 15% to 35%. The loss from a 200-tpd deinking facility can be from 30 to 70 tpd. This solid waste loss must be dealt with in an environmentally approved manner. The major portion of this solid waste can be burned, spread, or landfilled. A small portion must go to landfill.

EQUIPMENT FOR FLOTATION DEINKING. Major pieces of equipment in a flotation deinking system with washing include the following:

- Pulper: a high-consistency (15%) batch pulper with a separate dump screening system
- High-density cleaner: a high-density (3%) cleaner with automatic dump
- Coarse screens: a system including several stages. The coarse screen baskets can have holes with diameters as small as 0.040 in. Feedforward screening also should be considered.
- Fine screens: a system consisting of several stages. The fine-screen baskets can have slots with diameters as small as 0.006 in. Feedforward screening should be considered as an option.
- Washers: a system that might include sidedhill screens, screw extractors, gravity deckers, or new high-speed (3,000 fpm) washers
- Flotation cells: flotation done in multiple (up to eight) cells in series. A second stage of flotation may be used for fiber recovery.
- Forward cleaner system
- Reverse cleaners: follow the forward cleaners. The flowthrough reverse cleaners have high reverse cleaning efficiency and low reject rates. A mechanical reverse cleaner is being used in Europe.
- Disperger: a recent development, the disperger is similar to a refiner but without cutting plates. The stock feeding the disperger is hot (195°F) and at a high consistency (30%). The hot, thick stock is worked mechanically by the disperger, which breaks up many of the remaining contaminants, including both ink particles and stickies. After dispersion, the ink particles are below visual size.
- Water clarifier: because of a high level of water use, contaminants must be removed so that they are not reinjected into the stock. A dissolved air flotation (DAF) clarifier is used to remove contaminants from the water. A filter can be used ahead of the clarifier to reduce stock losses.
- Solid waste thickener: because most solid waste is removed from the system at a low consistency, it must be dewatered to the appropriate consistency for final disposition. The consistency could be 20% to 30% for landfill and more than 50% for incineration. The solid waste is typically thickened by a belt press for landfill and a screw press for incineration. The filtrate is recycled back to the process.

CHEMICAL PROCESS. In wastepaper deinking, especially flotation deinking, the chemistry is of paramount importance. Pulper chemicals include the following:

- Caustic for defibering
- Sodium silicate for a stabilizer
- Deinking chemicals:
  1. Dispersants for washing
  2. Collectors for flotation
  3. Displectors for washing and flotation
- Calcium chloride for water conditioning
- Hydrogen peroxide for bleaching and preventing yellowing of groundwood.

Process chemicals include defoamers and acid for pH adjustments. Water clarification and sludge thickening require individual polymers. Bleaching can range from none to minimal to extensive. Examples of minimal bleaching would include peroxide added to the pulper or hydrosulfite introduced at the end of the deinking process.

Extensive bleaching would be done in a multistage bleach plant. Typically, this would be CH or CEH. Because of the generation of dioxin in chlorine bleaching,

TABLE 5: **Capital cost range comparison for two wood-based facilities and two wastepaper facilities.**

Facility	Size (tpd)	Cost (× $1,000)
Wood-based facility		
Bleached kraft pulp	600 to 1,200	$600 to $450
Bleached CTMP	300 to 600	$400 to $330
Wastepaper facility		
Deink	200	$175 to $125
Pulp substitutes	200	$100 to $60

new bleaching sequences using chlorine dioxide, oxygen, and other chemicals are in the process of being developed. Black ink cannot be bleached, so it must be removed.

QUALITY CONTROL. Major factors affecting secondary fiber quality are the wastepaper and the capability of the process. Most processing equipment will remove a percentage of certain contaminants. Altogether, most contaminants will be removed, but some will still remain. Some contaminants will be removed in the papermaking process. The contaminants remaining in the paper must be within finished product specifications. Processed fiber specifications typically include the following:

- Brightness
- Dirt count
- Stickies count
- Ash
- Groundwood content.

Samples are taken from each pulper and visually inspected prior to discharging stock from the pulper. If the pulper sample is not satisfactory, steps, such as adding additional chemicals and extending pulping time, may be taken. If the pulper stock is not satisfactory for processing with these additional steps, then it is put in the bad-batch chest and blended with other upgraded stock.

Other possible actions are reprocessing off-quality stock through the system or increasing contaminant reject rates. Some process samples are taken at selected process locations to verify operating conditions. Bleach plant chemical addition rates are varied so that brightness can be controlled.

ECONOMICS. The capital cost ranges for an economy-of-scale (cost-effective) bleached wastepaper processing facility are lower than those for an economy-of-scale bleached wood-based fiber facility. Table 5 shows capital cost ranges.

An economy-of-scale wastepaper facility is smaller than an economy-of-scale wood-based facility. A wastepaper facility may be uniquely sized for a production level that is not appropriate for an economy-of-scale wood-based facility.

Bleached kraft pulp manufacturing costs vary widely. The deinking manufacturing cost range is within the bleached kraft pulp range. The pulp substitute manufacturing cost range is higher than the deink range. Fiber manufacturing cost ranges (given in dollars/ton) are as follows:

- Bleached kraft pulp: $236 to $445
- Bleached chemi-thermomechanical pulp: $225 to $275
- Deink: $325 to $375
- Pulp substitutes: $425 to $475.

Unit disposal costs at approved public landfills are high . . . Approved private landfills have proven to be not only expensive to construct but also costly to operate.

One of the elements in deink manufacturing cost, solid waste disposal, is currently in transition. Traditionally, deink solid waste disposal has been in public or private landfills at a low unit cost in the order of $10/ton. However, only a few landfills are approved. Unapproved landfills must shut down. Unit disposal costs at approved public landfills are high, at approximately $50/ton. Approved private landfills have proven to be not only expensive to construct but also costly to operate.

A typical 200-tpd deinking facility for tissue products would cost about $30 million. This cost includes wastepaper storage, flotation deinking with internal water clarification, and solid waste sludge thickening. In addition, mill services, such as steam and electric power, would necessarily be required to service the deinking facility.

The deinked fiber manufacturing cost would be about $350/ton. This is near the average manufacturing cost for bleached kraft pulp but with one-quarter of the capital cost. A nonintegrated tissue manufacturer not using deinked fiber would be using market pulp or pulp substitutes. Market pulp is currently selling at $700/ton and pulp substitutes at $450/ton.

Using deinked fiber instead of market pulp at a usage level of 200 tpd would result in savings of $350/ton or $70,000/day. This $24.5-million annual savings, with a 40% tax rate, would have a simple payout of two years on a $30-million deinking facility.

Using deinked fiber instead of pulp substitutes would result in $100/ton savings, or $20,000/day. The $7-million annual savings would result in a seven-year payout. Some pulp substitute equipment and buildings could be used in deinking, which would reduce the capital cost and the payout.

There are five major factors for success in secondary fiber:

- Commit to secondary fiber, even though it is different from virgin pulp
- Research the process and equipment
- Develop operating techniques that will optimize performance
- Investigate the causes of low-quality pulp and make the required changes
- Make sure the facility is appropriate to process the selected wastepaper into the quality of stock required to meet the finished product specifications. ■

U.S. Ports Put Major Emphasis on Pursuing Pulp and Paper Shipments

Survey of five ports indicates that major expansions and developments will assist paper companies with imports, exports

By KELLY H. FERGUSON, Projects Editor

As pulp and paper companies begin marketing their products beyond U.S. borders and as the "global marketplace" becomes a reality, inexpensive and efficient shipping becomes a necessity. U.S. ports will play an especially important role in shaping the market for U.S. companies.

To give an overview of current operation and future expansions, *Pulp & Paper* chose five U.S. ports in areas where the paper industry is especially strong—one in the Northwest, two on the East Coast, one on the Gulf of Mexico, and one in the Midwest. This is not intended to be an all-inclusive survey but is only a profile of some of the dominant ports.

ALABAMA STATE DOCKS.

Location: Mobile, Ala.
Number of shipping lines: 125
Number of trucking lines: 65
Major thoroughfares: Interstate 65, Interstate 10
Major waterways: Tennessee-Tombigbee Waterway
Major rail lines: Illinois Central, CSX, Burlington Northern, Norfolk Southern, Mid-South Rail
Shipping volume (based on 1988 tonnage figures):

- Total shipped out: 11,179,965
- Total shipped in: 5,563,558
- Tons shipped out of:

a. Kraft linerboard—170,395
b. Newsprint—4,649
c. Other paper—3,300
d. Market pulp—526,706
e. Woodchips—222,801

- Tons shipped in of:

a. Hardboard—6,070
b. Newsprint—2,632
c. Other paper—1,020
d. Market pulp—147,405

Facilities: 3.2 million ft^2 of covered warehouse space and 1.5 million ft^2 of open storage space. Maintains state-of-the-art pulp and paper handling equipment and RO/RO facilities next to forest products warehouses.

Expansions/developments: plans for expansion are under way to increase forest products warehousing facilities by approximately 350,000 ft^2. Through reconditioning of current warehouse facilities and additional new structures, the port will have a 362,000-ft^2 forest products berth and handling facility.

ASD recently purchased a site that is being reconditioned to offer 153,000 ft^2 of warehouse space and a 500-ft dock. This land includes 88,000 ft^2 of open storage.

In 1988, ASD completed reconditioning of a 173,000-ft^2 forest products terminal. By enhancing the capacity and handling facilities for forest products and maintaining regular service to all parts of the world, ASD offers pulp and paper companies an efficient and economical means to import and export their products.

Comments: Alabama State Docks continually pursues pulp and paper business. By working with rail and trucking lines to acquire the best service available at the best price and with steamship companies, freight forwarders, and stevedores to keep handling costs to a minimum and by keeping the most up-to-date facilities and equipment available, ASD is dedicated to these customers and giving them top service.

PORT OF SEATTLE.

Location: Elliot Bay on Puget Sound, Seattle, Wash.
Number of shipping lines: 30+
Number of trucking lines: 100+
Major thoroughfares: Interstate 5, Interstate 90
Major waterways: Puget Sound, Alaska, Transpacific
Major rail lines: Burlington Northern, Union Pacific
Shipping volume (based on 1988 tonnage figures):

- Total shipped out: 7,679,068
- Total shipped in: 4,162,031
- Tons shipped out of:

a. Wrapping/kraft paper—294,715
b. Newsprint—154,365
c. Paper/paperboard—57,151
d. Other paper—48,943
e. Market pulp—421,178

- Tons shipped in of:

a. Newsprint—240,785
b. Cigarette paper—15,024

c. Drawing/blueprint paper—7,202
d. Other paper—13,435
e. Market pulp—966

Comments: the Port of Seattle is primarily a container port. It was the leading U.S. port for exports of paper products in 1988 and one of the leading U.S. ports for export of woodpulp in 1988.

PORT OF GREEN BAY.

Location: Green Bay, Wis.
Number of shipping lines: 10
Major thoroughfares: Interstate 43, State Highway 41, State Highway 29
Major waterways: Great Lakes, St. Lawrence Seaway
Major rail lines: Fox River Valley Railroad, Wisconsin Central, Escanaba & Lake Superior, Chicago & Northwestern, Green Bay & Western
Shipping volume (based on 1988 tonnage figures):

- Total shipped out: 46,478
- Total shipped in: 1,655,522
- Tons shipped in of:

a. Market pulp—111,103

Facilities: woodpulp handled at Leicht Material Handling Dock, with three berths and 500,000 ft^2.
Expansions/developments: improving bulk handling facilities.
Comments: working with numerous paper companies to import paper machinery for their expansion.

GEORGIA PORTS AUTHORITY.

Location: Savannah, Ga.
Number of shipping lines: 50+
Number of trucking lines: 100+
Major thoroughfares: Interstate 16/Interstate 75, Interstate 95
Major waterways: South Atlantic
Major rail lines: CSX, Norfolk Southern
Shipping volume (based on 1987 tonnage figures):

- Total shipped out: 4,045,601
- Total shipped in: 6,153,512
- Tons shipped out of:

a. Kraft paper—346,386
b. Paper/paperboard—81,071
c. Hardwood—26,874
d. Market pulp—420,993

- Tons shipped in of:

a. Newsprint—23,165
b. Paper/paperboard—20,272

Expansions/developments: Georgia Ports Authority is planning for TIM-21 (Total Intermodal for the Twenty-First Century), which will provide ships with a land-based total transportation infrastructure. Updating of the Authorities COBRA computer system is ongoing. During 1988, a program was added that enables customs brokers to file paperless entries via a COBRA computer link to the U.S. Food & Drug Administration.

Ongoing enhancements to the COBRA system include a complete break-bulk export system, which will provide cargo receipts by all modes of transportation along with complete inventory control, warehousing functions, and automatic billing.

Savannah's Ocean Terminal is installing its first container crane. The 40-ton-capacity container crane will access eight berths at the Ocean Terminal. Also, construction has begun on the first phase of a sixth container berth, which will add 42 acres of container parking and 1,600 linear ft of berthing to the GPA Containerport.

PORT AUTHORITY OF NEW YORK AND NEW JERSEY.

Location: marine terminals located in Newark, N.J.; Elizabeth, N.J.; Brooklyn, N.Y.; and Staten Island, N.Y.
Number of shipping lines: approximately 100
Number of trucking lines: 10,000+
Major thoroughfares: Interstate 80, Interstate 95, Interstate 78, Interstate 278, Interstate 87
Major waterways: Kill Van Kull, East River, Hudson River
Major rail lines: Conrail
Shipping volume (based on 1988 tonnage figures—long tons):

- Total shipped out: 3,024,132 (general cargo)
- Total shipped in: 9,059,358 (general cargo)
- Tons shipped out of:

a. Paper and paperboard—70,902
b. Newsprint—12,463
c. Market pulp—5,189
d. Wastepaper--938,269
e. Woodchips—1,529

- Tons shipped in of:

a. Paper and paperboard—131,189
b. Newsprint—90,010
c. Market pulp—159,659
d. Wastepaper—6,029
e. Woodchips—2,018

Facilities: Maher Terminal in Port Newark, N.J., currently handles almost all forest products entering the Port of New York and New Jersey. The terminal uses more than 400,000 ft^2 of warehouse space for this type of storage in addition to unloading/loading this cargo efficiently with state-of-the-art pneumatic clamp truck equipment.
Expansions/developments: a $9.6-million rehabilitation program at Port Newark/Elizabeth is under way to upgrade warehouses that currently house forest products (in addition to the rehabilitation of other buildings), which will produce higher-quality storage areas to better accommodate this cargo.
Comments: the port authority is actively pursuing more business from the pulp and paper companies by collaborating with local transportation companies and terminal operators at the port in an effort to respond to the needs of both shippers and consignees. The primary objective is to put together competitive transportation packages that will maintain and attract additional business for the port. ■